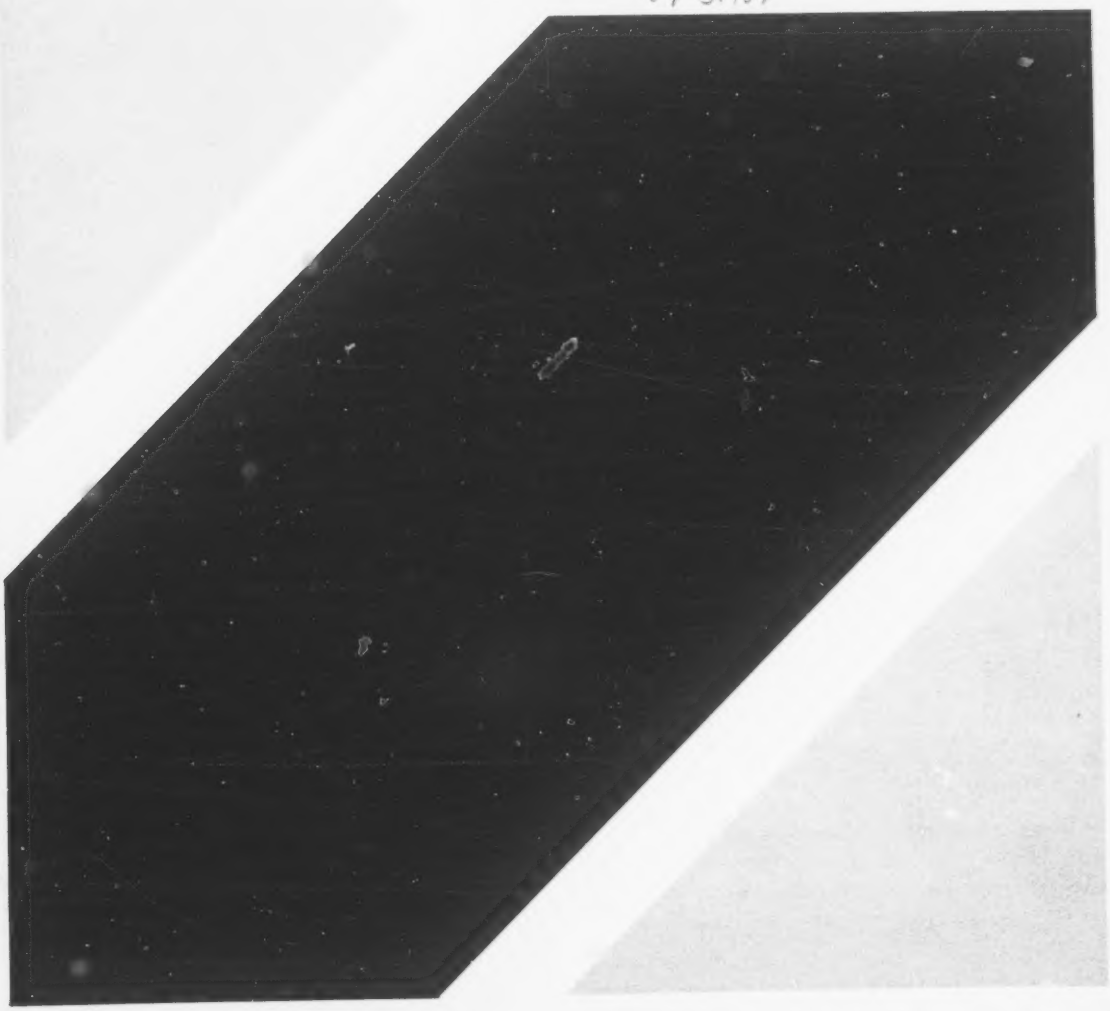
Annual Review 1980

U.S. ZINC and CADMIUM INDUSTRIES

Including Statements from Other Countries

A 9600-3 U
8/31/81



Review of Zinc in the United States in 1980

GENERAL SUMMARY

The U.S. zinc industry in 1980 followed the general recessionary trend of the economy with an 18% decrease in slab zinc consumption. Preliminary estimates put the 1980 U.S. consumption of zinc at 900,557 short tons, 202,421 tons less than the final 1979 consumption of 1,102,978 tons. Cutbacks in automobile production, as well as in housing starts and large construction projects, contributed to the sharp decline in consumption of nearly all primary metals.

An 18% decline in the production of raw steel had a corresponding 14% decrease in the use of zinc in galvanizing, the largest market for zinc consumption. Consumption of zinc in galvanizing went from 499,130 tons in 1979 to 432,676 tons in 1980.

Lower demand for consumer durables, such as automobiles and appliances, also affected the die casting market. Demand for zinc base alloy declined 22% from 346,187 tons in 1979 to 269,697 tons in 1980. The automotive industry, which accounts for nearly 50% of the zinc die casting market, felt the effects of climbing interest rates with car and truck sales off 18%.

The trend toward smaller and lighter cars for increased fuel efficiency, mandated by the government, has caused the substitution of zinc die cast parts by lighter and less expensive materials, such as plastics, aluminum and magnesium.

The use of zinc in brass and bronze markets suffered the largest decline of all zinc-use segments in 1980, nearly 31%. High interest rates and a 25% decrease in the construction of new housing units affected this market, which went from 155,871 tons in 1979 to 107,388 tons in 1980.

Zinc oxide, also affected by the low automotive production, declined 16% from 39,146 tons in 1979 to 32,919 tons in 1980. Other uses, which include zinc dust, desilverizing lead, light metal alloys and zinc chemicals, declined 10% from 38,345 tons in 1979 to 34,619 tons in 1980.

Rolled zinc, used for roofing, other architectural uses and batteries, was least affected by economic conditions in 1980 with a decline of only 4% from 24,299 tons in 1979 to 23,258 tons in 1980.

Major market categories showed the following changes in 1980 consumption compared to the final figures for 1979. This includes allocation of 100,531 tons estimated as unreported by the U.S. Bureau of Mines:

CONSUMPTION - SHORT TONS

	1979	(Preliminary) 1980
Galvanizing	499,130	432,676
Brass & Bronze	155,871	107,388
Zinc Base Alloy	346,187	269,697
Rolled Zinc	24,299	23,258
Zinc Oxide	39,146	32,919
Other Uses	38,345	34,619
Total	1,102,978	900,557

Consumption of zinc alloys for die casting may be broken out from slush, sand and rods as follows:

	1979	(Preliminary) 1980
Die casting alloys	340,307	262,253
Slush, sand & rod alloys	5,880	7,444
	346,187	269,697

Source: U.S. Bureau of Mines

Primary producers in the U.S. operated at an average 70% capacity in 1980. Smelter stocks declined from 61,543 tons at the end of 1979 to 20,564 tons at the end of 1980. Producer stocks elsewhere were reduced from 17,909 tons end 1979 to 9,420 end 1980. Consumer stocks also fell from 86,984 tons, end 1979, to 64,216 tons, end 1980.

U.S. primary smelter production fell nearly 34% in 1980 due to weakened demand in a recessionary year and a shortage of concentrates. U.S. smelters produced 358,609 tons of slab zinc in 1980, compared to 537,427 tons in 1979.

Domestic smelter capacity was further reduced in 1980 by the closing of New Jersey Zinc's Palmerton, Pa. primary smelter. New Jersey Zinc, a subsidiary of G + W Natural Resources, cited weak demand and low prices as the reason for closing its 118,000-ton-per-year smelter, but it plans to continue its production of zinc oxide. Over the past 10 years such closures have reduced total domestic annual production capacity of zinc by nearly 61%. Discovery of a 15% zinc ore body at its Pierreport, N.Y. property prompted St. Joe Minerals Corp. to partially reactivate its Monaca, Pa. facility. The smelter, closed in December 1979, is scheduled to produce an estimated 50,000 tons of metal per year. The closing of New Jersey Zinc and reopening of St. Joe brings U.S. yearly smelting capacity to an estimated 500,000 tons.

Zinc mine production in the U.S. rose 18% from 294,075 tons in 1979 to 345,086 tons in 1980. Greater zinc ore and concentrate production in 1980 was due to the opening of a new mine and the absence of strikes.

ASARCO, Incorporated announced plans to develop a mine at its West Fork, Missouri lead-zinc ore body. West Fork, the first new U.S. lead-zinc mine since 1974, will reach full production of 7,500 tons per year of zinc in 1984. St. Joe Minerals Corp. expects to ship 450 tons of ore per day from the Pierrepont zinc mine which is under development near its operations at Balmat, N.Y.

Exxon continued studies on the taxation and environmental impact of developing its Crandon, Wisconsin zinc property. Noranda announced the reopening of the Ontario Mine in Utah. Superior Oil continued zinc exploration in Bald Mountain, Maine. Preliminary studies in the National Alaskan Petroleum Reserve by the U.S. Bureau of Mines indicate there may be significant signs of zinc mineralization which may increase domestic ore reserves. However, this land is not open to mineral development.

The U.S. Bureau of the Census reported exports of zinc in slabs, pigs and blocks at 333 tons and in sheets, plates and strips at 4,077 tons.

Imports for consumption of zinc ores and concentrates increased 48% from 96,447 tons in 1979 to 143,212 tons in 1980. Major sources for ores and concentrates were Canada at 49%, Peru at 31%, Mexico at 12%, and Honduras at 5%. General imports of slab zinc were lower in 1980 at 452,652 tons as compared to 577,749 tons in 1979, a decrease of 22%. Canada supplied 68%, Australia 6%, Mexico 6%, and Finland 3%. Imports of slab zinc increased from Canada, the Netherlands and the United Kingdom, while imports significantly decreased from Spain, Mexico, Australia, Belgium, Finland, Germany, Japan, Peru, and Zaire.

U.S. zinc prices started 1980 at 37.50 cents per pound. After a brief rise to 39.50 cents in February, zinc prices hit a low of 35.50 cents in June, from which they climbed steadily reaching their highest level of 41.50-41.75 at yearend. In August U.S. producers changed the premium pricing structure for zinc, adopting High-Grade as the base instead of Prime Western, reflecting the premium for Prime Western from electrolytic plants. The average price for 1980 was 37.4 cents per pound. Zinc prices on the London Metal Exchange established the price trend, hitting a low of 30 cents in August and ending the year on a high of 37 cents. LME stocks started 1980 at 48,200 metric tons, remained flat through the first quarter, climbed steadily for the second and third quarters, and increased sharply to 85,925 by the end of December 1980.

SUPPLY

U.S. mine production of zinc increased nearly 18% in 1980, rising from 294,075 tons in 1979 to 345,086 tons in 1980. Major ore producing states were Tennessee, Missouri, New York and New Jersey. It is expected that with new mine openings in 1980 and continued exploration and development of zinc mine projects, the U.S. will see further increases in mine production. Imports, both general and for consumption, of zinc ores and concentrates declined in 1980. General imports went down 42% from 247,961 tons in 1979 to 143,214 tons in 1980. Imports of ore for consumption were reduced by 11% from 96,447 tons to 86,293 tons.

U.S. smelters produced 18% less slab zinc, dropping from 514,254 tons in 1979 to 399,588 tons in 1980. Imports of slab zinc for consumption fell 22% from 577,749 tons in 1979 to 448,876 tons in 1980. General imports of slab zinc also fell 22% from 581,148 in 1979 to 452,652 in 1980.

Producer stocks at U.S. smelters declined a significant 67% from 61,543 tons, end 1979, to 20,564 tons, end 1980. Table 2 shows that producer stocks declined steadily throughout the year. Producer stocks elsewhere dropped 47% from 17,909 tons, end 1979, to 9,420 tons, end 1980. Consumer stocks also fell, from 86,984 tons, end 1979 to 64,216 tons, end 1980.

TABLE 2. PRODUCER AND CONSUMER ZINC STOCKS
(Tons of 2,000 lbs.)

	End 1979	End 1980
Producer Stock at Smelters	61,543	20,564*
Producer Stock Elsewhere	17,909	9,420*
Consumer Stock	86,984	64,216†

Source: †U.S. Bureau of Mines
*American Bureau of Metal Statistics

Decline in demand affected shipments from U.S. producers to consumers, which fell 22% from 514,254 tons in 1979 to 399,588 in 1980.

In May 1980 the Federal Emergency Management Agency increased the stockpile goal for zinc from 1.31 million tons to 1.43 million tons, of which 375,000 tons were on hand.

CONSUMPTION

The consumption of zinc in the United States was reported at 900,557 tons by the U.S. Bureau of Mines, a decrease of 18% from the 1979 consumption of 1,102,978 tons.

1980 CONSUMPTION OF SLAB ZINC BY MARKET SEGMENTS

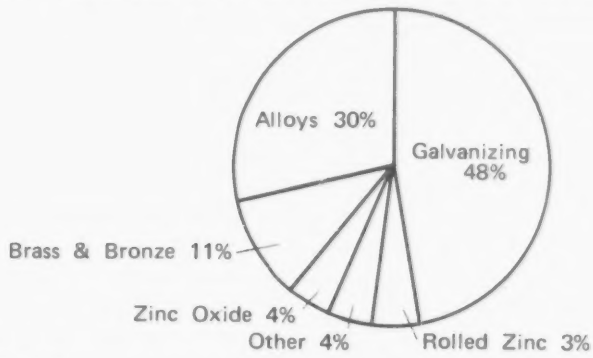


Table 3 itemizes zinc consumption among its various general markets. In this table 100,531 tons of "Estimated Unreported" from the U.S. Bureau of Mines have been allocated to end use markets, largely to galvanizing and zinc base alloys.

TABLE 3. U.S. SLAB ZINC CONSUMPTION BY MARKETS
(Tons of 2,000 lbs.)

	1976	1977	1978	1979	(Preliminary) 1980*
Galvanizing	433,083	436,998	500,464	499,130	432,676
Brass & Bronze	166,244	141,438	155,964	155,871	107,388
Zinc Base Alloy	427,031	404,691	390,365	346,187	269,697
Rolled Zinc	29,859	30,210	27,413	24,299	23,258
Zinc Oxide	39,027	42,454	41,008	39,146	32,919
Other[1]	38,897	45,974	42,856	38,345	34,619
Total	1,134,141	1,101,765	1,158,070	1,102,978	900,557

*Estimated undistributed numbers have been added to End-Use categories.
[1]Zinc dust, light metal alloys, desilverizing lead, other zinc chemicals, etc.

Source: U.S. Bureau of Mines

Using these estimates, galvanizing declined 14% from 499,130 tons in 1979 to 432,676 tons in 1980; zinc consumed in zinc base alloys decreased 22% from 346,187 tons in 1979 to 269,697 tons in 1980; brass and bronze consumed 107,388 tons of zinc in 1980 as opposed to 155,871 tons in 1979, off 31%; rolled zinc showed the smallest loss, 4%, going from 24,299 tons in 1979 to 23,258 tons in 1980; zinc oxide took a 16% decline from 39,146 tons in 1979 to 32,919 tons in 1980; and other uses, which include zinc dust, desilverizing lead, light metal alloys and chemicals, declined 10% from 38,345 tons in 1979 to 34,619 tons in 1980.

Depressed construction and automotive industries caused the second deepest decline in the steel industry in 22 years with shipments reduced 18%. The decline in steel shipments reduced consumption of zinc in galvanizing by 14%, from 499,130 tons in 1979, to 432,676 tons in 1980. The major markets for galvanized steel are commercial construction, tube and pipe and the automotive and agricultural industries. Table 4 shows decreased shipments for all galvanized steel categories in 1980 compared to 1979 with the sharpest declines in tube and pipe, structural shapes and fencing and wire cloth.

TABLE 4. CONSUMPTION OF SLAB ZINC FOR GALVANIZING
(Tons of 2,000 lbs.)

	1979	1980
Sheet and Strip	295,226	241,339
Wire and Wire Rope	25,967	22,729
Tube and Pipe	50,313	38,347
Fittings (for tube and pipe)	9,073	5,820
Tanks and Containers	4,499	4,226
Structural Shapes	37,341	21,413
Fasteners	5,504	3,005
Pole-Line Hardware	5,334	4,237
Fencing, Wire Cloth and Netting	24,163	13,325
Other and Unspecified Uses	41,710	25,985
Total	499,130	380,426
Estimated Undistributed		52,250
	Total	432,676

Source: U.S. Bureau of Mines

Die casting responded to lessened automotive appliance and hardware production with a 22% decline in consumption of zinc for die casting. Use of zinc in zinc base alloys went from 346,187 tons in 1979 to 269,697 tons in 1980.

The Seventh Annual Zinc Institute Survey of 433 zinc die casters reported 313,807 tons of zinc die castings shipped in 1980 as compared to the 269,697 tons reported by the U.S. Bureau of Mines. The additional 44,110 tons reported in the Zinc Institute Survey are ascribed to zinc alloyers not reporting to the Bureau of Mines (Table 5).

TABLE 5. U.S. ZINC DIE CASTING TONNAGE
(Tons of 2,000 lbs.)

1980	313,807
1979	382,655
1978	416,382
1977	418,319
1976	416,450

Source: Zinc Institute Annual Survey

Of the total zinc die casting market in 1980 the automotive market remained the largest at 103,593 tons. However, it accounted for 33% of the zinc die castings in the 1980 versus 43% in 1979 (Tables 6 and 7). Next largest market was again builders hardware at 83,767 tons or 27% of the total, followed by electrical components at 41,666 tons, or 13%. Other markets were industrial, agricultural and commercial machinery at 28,014 tons or 9%; domestic appliances at 25,128 tons or 8%; sporting goods and toys at 10,220 tons or 3%; scientific and professional equipment at 4,642 tons or 1.5%; sound and television equipment at 3,969 tons or 1.3%; and miscellaneous industries at 12,808 tons or 4%.

TABLE 6. ZINC DIE CASTINGS USED IN AUTOMOTIVE COMPONENTS*
(Tons of 2,000 lbs.)

1980	103,593
1979	165,761
1978	192,492
1977	205,801
1976	206,597

*These figures represent zinc die casting tonnage shipped January to January including the automotive aftermarket as well as buses and trucks.

Source: Zinc Institute Annual Survey

TABLE 7. WEIGHT OF ZINC IN THE AVERAGE CAR

	lbs. per car
1980	24.24
1979	27.98
1978	30.02
1977	39.53
1976	44.84

Source: Zinc Institute Annual Survey

The consumption of zinc in brass and bronze decreased sharply in 1980, from 155,871 tons in 1979 to 107,388 tons. This loss of nearly 31% was due largely to a depressed housing market.

Rolled zinc maintained its markets with only a 4% loss from 24,299 tons in 1979 to 23,258 tons in 1980. Primary markets for rolled zinc are battery cans for dry cell batteries and architectural uses.

Zinc oxide, used in tires and zinc-rich paints, lost 16% of its market in 1980, going from 39,146 tons in 1979 to 32,919 tons in 1980. The poor automotive year was the chief factor in the decline. Statistics for the production and shipments of zinc oxide are shown in Table 8.

TABLE 8. PRODUCTION AND SHIPMENTS OF LEAD FREE ZINC OXIDE
(Tons of 2,000 lbs.)
(Both French and American Processes)

	Production	Shipments
1980		
American	85,073	82,633
French	50,446	51,310
Other*	14,565	13,255
	150,084	147,198
1979		
American	107,519	108,896
French	64,095	67,248
Other*	13,359	13,358
	184,973	189,502
1978		
American	115,956	114,651
French	70,021	67,642
Other*	12,572	13,146
	198,549	195,439
1977		
American	116,835	118,050
French	67,455	67,863
Other*	16,429	16,297
	200,719	202,210
1976		
American	114,923	111,110
French	59,420	64,890
Other*	15,714	15,939
	190,057	191,939

*From residue and scrap

Source: U.S. Bureau of Mines

Note: French process zinc oxide is produced from slab zinc, remelt and scrap. American process is produced from ore and ore-scrap residues. All tonnages adjusted from preliminary data in previous Annual Reviews to final annual data from Bureau of Mines.

Other uses, which include light metal alloys, zinc dust, desilverizing lead, zinc chemicals and miscellaneous uses, decreased 10% from 38,345 tons in 1979 to 34,619 tons in 1980.

Detailed statistics on U.S. production, consumption and foreign trade of zinc are given in Tables 9-16.

TABLE 9. PRODUCTION OF ZINC DUST IN THE U.S.
(Tons of 2,000 lbs.)

1980	47,003
1979	39,888
1978	42,425
1977	47,594
1976	46,358

Source: U.S. Bureau of Mines

TABLE 10. SALIENT STATISTICS SLAB ZINC-UNITED STATES
(Tons of 2,000 lbs.)

	1979	1980
U.S. Mine Production	294,075	345,086†
U.S. Slab Production	537,427	358,609*
Shipments from Smelters:		
Domestic	514,254	399,588*
Export	—	—
Total	514,254	399,588*
U.S. Government Stockpile Sales	—	—
Consumption	1,102,978	900,557†
Producers' Year End Stocks:		
Smelters	61,543	20,564*
Elsewhere	17,909	9,420*
Consumers' Stocks	86,984	64,838†
Imports for Consumption:		
Zinc Content of Concentrate	96,447	86,293*
Slab	577,749	448,876†
General Imports:		
Zinc Content of Concentrate	247,961	143,214*
Slab	581,148	452,652*
Average Price		
U.S. Zinc, Metal	37.3¢/lb.	37.4¢/lb.

Source: †U.S. Bureau of Mines
*American Bureau of Metal Statistics

TABLE 11. U.S. MINE PRODUCTION OF RECOVERABLE ZINC
(Tons of 2,000 lbs.)

State	1979	(Preliminary) 1980
Arizona	—	40
Colorado	10,901	14,899
Idaho	32,626	30,845
Missouri	67,850	68,401
Montana	114	77
New Jersey	34,230	31,736
New York	13,346	w
Pennsylvania	23,592	25,407
Tennessee	93,631	122,765
Virginia	12,547	12,139
Other States [1]	5,238	38,777
Total [2]	294,075	345,086

Source: U.S. Bureau of Mines

w Withheld to avoid disclosing individual company confidential data; included in "other states."
1) Includes California, Illinois, Nevada, New Mexico, Utah, Wisconsin.
2) Data do not add to total shown because of independent rounding.

TABLE 12. (SUPPLEMENTS TABLE I)
U.S. PRODUCTION OF SLAB ZINC BY GRADES
(Tons of 2,000 lbs.)

	1976	1977	1978	1979	1980
Special High Grade (99.99% Zn)	242,131	158,797	198,209	212,783	193,970
Regular High Grade	30,401	31,878	36,189	50,278	22,971
Intermediate	18,143	12,930	—	—	—
Prime Western (including Brass Special and Select)	245,278	230,449	252,241	274,366	140,813
Total	535,953	434,054	486,639	537,427	357,574*

Source: American Bureau of Metal Statistics
*Variance in production total due to change in reporting procedures by ABMS.

TABLE 13. U.S. SLAB ZINC CONSUMPTION BY GRADES
(Tons of 2,000 lbs.)

	1976	1977	1978	1979	(Preliminary) 1980
Special High Grade	551,270	543,047	541,590	488,439	388,258
High Grade	111,407	100,302	120,971	119,694	77,648
Intermediate	23,204	21,874	24,063	24,823	21,374
Brass Special	104,460	111,483	108,419	95,701	80,651
Prime Western & Select	342,538	323,710	361,206	371,255	331,144
Remelt	1,262	1,349	1,821	3,066	1,482
Total U.S.	1,134,141	1,101,765	1,158,070	1,102,978	900,557

Source: U.S. Bureau of Mines

TABLE I. TOTAL SLAB ZINC SMELTER OUTPUT REPORT (ALL GRADES) Tons of 2,000 lbs.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	PRODUCERS STOCK AT BEGIN.		GSA METAL		TOT.	SHIPMENTS-INCLUDE GSA (Countries)				PRODUCERS STOCK AT END			
	Smelters	Elsewhere	Smelter Production Incl. GSA Metal	Purchased for direct Shipment	Available (1+3+4)	Domestic	Export+ OECD	Drawback Other	Total 6+7+8	Smelters 5 - 9	Elsewhere	Daily Avg. Prod.	GSA Metal Included in Col. (3)
1970	78,313	12,146	961,153	—	1,039,466	891,511	—	20,630	912,141	127,325	28,905		
1971	127,325	28,905	840,178	—	967,503	906,377	—	10,537	916,914	50,589	15,433		
1972	50,589	15,433	765,415	34,672	850,676	814,609	—	4,292	818,901	31,775	131,185		81,467
1973	31,775	13,185	687,861	54,917	774,553	726,531	1,130	17,599	745,260	29,293	4,287		11,907
1974	29,293	4,287	590,181	76,262	695,736	643,900	1,378	7,561	652,839	42,897	2,691		44,636
1975	42,897	2,691	445,916	443	489,256	421,747	—	60	421,807	67,449	22,040		3,688
1976	67,449	22,040	535,953	—	603,402	514,595	—	—	514,595	88,807	28,277		97
1977	88,807	28,277	434,054	—	522,861	457,074	—	—	457,074	65,787	51,956		—
1978	65,787	51,956	444,790		510,577	472,207			472,207	38,370	22,631		
1979	38,370	22,631	537,427	—	575,797	514,254	—	—	514,254	61,543	17,909	—	—
1980													
Jan.	61,543	17,909	30,511	—	92,054	44,511	—	—	44,511	47,543	26,293	984	—
Feb.	47,543	26,293	30,613	—	78,156	44,171	—	—	44,171	33,985	24,422	1,093	—
Mar.	33,985	24,422	34,777	—	68,762	36,848	—	—	36,848	31,914	21,004	1,122	—
Apr.	31,914	21,004	32,123	—	64,037	32,653	—	—	32,653	31,384	21,798	1,071	—
May	31,384	21,798	31,922	—	63,306	26,358	—	—	26,358	36,948	23,843	1,030	—
June	36,948	23,843	28,452	—	65,400	22,558	—	—	22,558	42,842	26,719	948	—
July	42,842	26,719	20,774	—	63,616	21,518	—	—	21,518	42,098	25,001	670	—
Aug.	42,098	25,001	26,703	—	68,801	33,369	—	—	33,369	35,432	23,306	861	—
Sept.	35,432	23,306	28,613	—	64,045	33,961	—	—	33,961	30,084	20,184	954	—
Oct.	30,084	20,184	30,990	—	61,074	37,643	—	—	37,643	23,431	15,891	1,000	—
Nov.	23,431	15,891	29,884	—	53,315	32,726	—	—	32,726	20,589	11,276	996	—
Dec.	20,589	11,276	33,247	—	53,836	33,272	—	—	33,272	20,564	9,420	1,072	—
Year			358,609			399,588			399,588				
Monthly Average			29,884			33,299			33,299				

Source: American Bureau of Metal Statistics

TABLE 14. EXPORTS (DRAWBACK NOT INCLUDED)
(Tons of 2,000 lbs.)

	Slabs, Pigs & Blocks	Sheets, Plates, Strip or other forms N.E.S.*
1980	333	4,077
1979	308	3,393
1978	852	2,680
1977	236	8,829
1976	3,513	10,537

*Includes semifabricated forms N.E.S.

Source: Bureau of Census via American Bureau of Metal Statistics

TABLE 15. ZINC ORE GENERAL IMPORTS
(Tons of 2,000 lbs.) Zinc Content

	1976	1977	1978	1979	1980
Australia	2,291	4,343	2,041	779	1,623
Bolivia	785	4,991	438	13,155	—
Canada	69,901	58,578	157,980	158,685	69,465
Chile	—	11,784	6,540	1,367	—
Colombia	14	18	11	17	16
Costa Rica	—	851	—	—	—
Germany, Federal Republic of	231	812	7,204	8,598	2,670
Greenland	530	—	—	—	—
Honduras	16,307	17,369	14,486	14,750	7,750
Mexico	2,625	4,289	2,879	17,867	17,405
Nicaragua	3,637	3,051	4,460	4	—
Peru	794	1,034	11,087	32,736	44,285
Thailand	—	15,688	—	—	—
Other Countries	—	—	111	2	—
Total	97,115	122,808	207,237	247,961 (1)	143,214

1.) May not add to total because of independent rounding.

Source: U.S. Bureau of Mines

TABLE 16. SLAB ZINC GENERAL IMPORTS
(Tons of 2,000 lbs.)

	1976	1977	1978	1979	1980
Algeria	999	1,278	2,808	5,750	6,619
Australia	32,586	29,262	38,344	37,173	27,334
Austria	—	—	—	—	693
Belgium-Luxembourg	35,473	42,971	21,181	18,242	2,546
Canada	313,006	239,555	288,631	286,096	308,726
China, Peoples Republic of	2,532	1,109	883	229	1,346
Finland	31,526	32,669	36,337	23,244	14,251
France	10,397	17,427	25,159	14,818	13,269
Germany, Federal Republic of	48,665	41,552	40,736	21,064	13,289
Italy	30,739	21,602	12,290	6,054	2,204
Japan	9,483	14,353	9,485	11,152	—
Korea, Republic of	—	—	4,409	2,535	1,543
Mexico	62,638	29,981	56,737	43,357	26,300
Netherlands	9,642	6,424	11,130	3,504	7,174
Norway	1,102	—	—	—	—
Peru	19,911	18,885	11,293	8,150	4,354
Poland	1,118	3,941	6,250	110	—
South Africa, Republic of	3,650	5,885	8,942	—	—
Spain	29,687	28,339	66,387	73,567	11,825
Tanzania	—	—	—	—	1,133
United Kingdom	1,820	1,643	1,099	2,626	4,533
Yugoslavia	29,869	3,574	4,163	—	—
Zaire	36,922	35,707	28,252	16,402	—
Zambia	2,649	579	2,870	5,518	5,513
Other	175	—	3,665	1,554	—
Total	714,589	576,736	681,051	581,148[1]	452,652

1.) Total may not add because of independent rounding.

Source: U.S. Bureau of Mines

OUTLOOK

Economists forecast recovery from the economic downturn in 1980 with moderate improvement in overall economic conditions, growth in real GNP and increased production in most segments of the U.S. economy. Primary metals dropped sharply in 1980 in response to major cutbacks in construction and automotive production. Expected improvement in the 1981 economy will bring a modest increase in demand for construction, automobiles and appliances, increasing demand for primary metals in nearly all markets.

Increased steel imports and lighter coating weights have caused a decline in galvanized steel shipments in recent years. An expanding economy, coupled with growing awareness of the need for corrosion protection, should contribute to an increased demand for zinc coated steels. The trend in the automotive industry illustrates how consumer demand for increased product life stimulates growth of galvanized steel markets. Automobile manufacturers advertise the toughness and durability of galvanized steel in their vehicles as an added guarantee against corrosion and perforation. Use of galvanized steel in automobiles has nearly doubled in the past ten years and this trend is expected to continue.

Both commercial and residential construction are predicted to increase in 1981. Projections for commercial construction indicate that the use of galvanized steel will expand significantly in the next few years and perhaps even double by 1985. With an increasing number of producers opening lines in the U.S., Galvalume continues to threaten some of galvanized steel's longest term markets, particularly in the building industry. New developments in other zinc alloy coating systems will help to minimize the effects of Galvalume penetration into these markets.

Increased housing starts will affect both the availability and cost of traditional house framing materials. Higher cost of these materials should enhance the cost benefits related to the use of galvanized steel framing and increase the demand for galvanized steel as the cost effective method of framing new housing.

Use of zinc die casting in automotive applications is expected to stabilize with a levelling off in downsizing. As the automotive industry recovers from a disastrous year in 1980, die casting shipments should increase. Increased consumer spending will stimulate other zinc die casting markets such as appliances, hardware and electrical components.

With the addition of three new casting alloys, the zinc industry is making a major effort to significantly expand the foundry casting markets for zinc. This would involve both gravity cast and permanent mold cast zinc alloys as replacements for conventional brass, bronze, iron and aluminum castings.

Concerns over energy supplies have afforded zinc an opportunity to provide vehicles of the future with battery powered energy systems. Intensive research and development continues in both the zinc chloride and the nickel zinc oxide battery systems for electric vehicles. More work is required to make these systems commercially viable but projections for the automotive industry include as many as 900,000 electric passenger

vehicles on the road by 1995. With estimated battery requirements of 100-150 lbs. of zinc per vehicle, even a small penetration into the electric vehicle market could create a substantial new market for zinc. The zinc battery is also being considered for load levelling applications.

Interest grew throughout 1980 in zinc as a medium of coinage. The U.S. Mint undertook studies which recommended that zinc plated with copper replace the current 95% copper / 5% zinc penny. High copper prices, along with savings in energy and the balance of payments, make this change an attractive one for the taxpayer. An estimated 40,000 tons of zinc would be used to produce 10.8 billion pennies per year if the Mint makes the switch.

Rolled zinc is also looking to expand markets in architectural uses, plumbing hardware, fasteners and electrical components. The current market for dry cell battery cans appears to be a stable one.

Zinc rich paints continue to be competitive in automotive and marine applications. As consumers become more interested in the life and durability of goods, this method of protecting steel should continue to grow.

ILZRO ZINC AND CADMIUM RESEARCH - 1980

The initial gains in computerization of zinc die casting design in 1979 were extended and broadened in 1980 with the development by ILZRO, in close cooperation with the Zinc Institute, of additional software programs for locating waterlines in zinc die casting dies and for cost estimating and analysis. The programs, and accompanying manuals, were made available in metric and English units, thus making them suitable worldwide.

Some of the most significant research results, however, were in the galvanizing area. Perhaps most important was the effort to develop a new zinc-5% aluminum-X alloy that would be suitable for continuous coating of steel sheet. By yearend, indications were strong that the alloy under development would give improved corrosion resistance and longer service life than conventionally galvanized steel. Pilot run tests also demonstrated that this alloy has excellent coatability, with no problems. Test samples have demonstrated that the alloy coating also provides edge protection and improved protection against scratches, properties which would give it a performance edge over Galvalume. Another advantage vis-a-vis Galvalume is the much lower bath temperature that the new alloy requires. Expectations were that the alloy development would be ready for pilot production run tests in mid-1981.

A manual on ILZRO research of high temperature galvanizing of structural steels and other components was completed and distributed in mid-1980. The research demonstrated that high temperature galvanizing, i.e., galvanizing at 550°C (1022°F), is not only technically feasible but economically viable.

The technical feasibility of using salt bath preheating in conjunction with batch galvanizing was verified in a series of tests conducted in cooperation with The Southern Galvanizing Company in Baltimore, Md. A summary report on this research, which improves the capability of

galvanizers to produce thinner coatings on silicon steel, among other advantages, is expected to be available in 1981.

In zinc and cadmium chemical research, ILZRO's efforts in 1980 were directed to such specific market areas as paints, plastics and ceramics, as well as cadmium in chemicals for energy storage, thin film solar cells and ceramic glazes. In zinc-rich paint research, the work has reached the stage where the ILZRO results will form the basis for specifications being prepared by the Steel Structures Painting Council. In related work, ILZRO worked closely with U.S. automobile companies and several steel companies on development of improved paint pretreatment methods for cold-rolled steel and galvanized steel, as well as welded joints of these two metals.

In the field of ceramics, ILZRO developed various colors for low-melting zinc polyphosphate glasses for applications such as enameling of metals.

ILZRO also conducted a broad-based engineering development program aimed at defending zinc die casting markets that are under threat, and at the same time, extending application of zinc in other areas to compete with conventional materials. The aim is beyond the automotive die casting market alone and takes in such new markets as the general foundry market, forgings, and stampings. To stimulate the use of zinc alloys in these and other applications, ILZRO published a 110-page manual, *Engineering Properties of Zinc Alloys*, which presented all the available engineering data on die casting, gravity casting and mechanical properties of these alloys.

In other zinc development efforts, ILZRO has effectively pushed the use of trivalent chromium plating as a finish for zinc die castings, to increase their corrosion resistance as well as improve their appearance.

ZINC IN AUSTRALIA 1980

Mr. C.J. Bain, Director
Australian Zinc Development Association
Melbourne, Australia

Australian primary zinc sales in 1980 were 95,018 tonnes, a decrease of 2.3% from 1979 sales of 97,258.

PRIMARY ZINC SALES IN AUSTRALIA BY END USES
(Metric Tons)

End Use	1979	1980
Galvanizing		
General	13,126	15,126
Sheet	36,678	34,754
Wire	7,555	7,583
Pipe & Tubes	10,300	10,212
Total	67,659	67,675
Brass	8,557	7,574
Diecasting	9,051	8,479
Rolled Zinc	2,680	2,444
Zinc Dust	2,785	2,571
Zinc Oxide	4,261	3,991
Miscellaneous	2,265	2,284
Total	29,599	27,343
GRAND TOTAL	97,258	95,018

Zinc sales showed a slight decrease in most end use areas compared to the previous year. The only end use area showing significant growth was general galvanizing where a 15.2% increase was recorded compared to the previous year.

Zinc sales to the general galvanizing industry from 1975 to 1980 are listed below and show the dramatic growth that has occurred in this end use sector over the period.

	Tonnes	% Increase
1975	9,541	—
1976	10,130	+ 6.2
1977	10,838	+ 7.0
1978	11,840	+ 9.3
1979	13,126	+10.9
1980	15,126	+15.2

ZINC IN BRAZIL 1980

Douglas Melhen, Jr.
Brazilian Lead, Nickel and Zinc Information Institute
Sao Paulo, Brazil

	1980
Domestic Mine Production	31,270
Domestic Refined Metal Production	
Primary:	78,303
Secondary:	17,666
Total	95,969
Imports	59,739
Exports	333
Apparent Consumption	155,375

ZINC IN CANADA 1980

M.J. Gauvin
Energy, Mines and Resources Canada
Ottawa, Ontario

Canada is the world's largest producer and exporter of zinc and about 25 per cent of Western world demand is supplied by Canadian mines. Canadian consumption of zinc is about 10 per cent of its production. Canadian refinery capacity of 710,000 tons, sufficient to process about one-half of domestic mine production to refined metal, is in the process of being expanded to 767,000 tons. Canadian refined metal production in 1980 was 652,088 tons. Mine production decreased in 1980 because of numerous strikes and unexpected production problems at some producers. All mine production was contracted for sale or processed domestically.

Consumption in 1980 is estimated to be 146,055 tons, an increase of about 4 per cent over 1979. High metal shipment during the year kept metal inventories at normal levels.

CANADIAN ZINC PRODUCTION AND SHIPMENTS
(Tons of 2,000 lbs.)

	Production		Shipments (Refined Primary Metal)			
Year	Mine Output	Refined Primary Metal	Within Canada	To U.S.A.	To Other Countries	Total
1974	1,330,331	482,509	148,403	259,641	67,423	475,467
1975	1,355,269	470,630	149,460	182,251	75,768	407,479
1976	1,262,161	520,639	146,793	300,013	95,263	542,069
1977	1,433,256	545,521	144,007	228,531	93,499	466,037
1978r	1,372,651	545,906	159,548	268,178	216,354	644,080
1979r	1,327,625	639,835	169,474	283,862	179,080	632,416
1980P	1,666,882	652,088	146,104	310,354	221,980	678,438

r revised; P preliminary.

CANADIAN CONSUMPTION OF PRIMARY ZINC
(Tons of 2,000 lbs.)

Year	Galvanizing	Casting	Brass	Other	Total
1974	70,000	30,500	15,500	24,000	140,000
1975	65,000	26,600	10,000	20,700	122,300
1976	66,000	28,800	12,400	22,400	129,600
1977	68,000	28,000	13,000	23,000	132,000
1978r	77,038	13,317	14,856	24,168	129,377
1979	83,512	18,232	12,772	26,116	140,632
1980P	n.a.	n.a.	n.a.	n.a.	146,055e

Ppreliminary - data
rrevised
eestimated
n.a. Not available

Data from 1974 to 1977 inclusive are Zinc Institute estimates. Data from 1978 are from Statistics Canada which does not include a number of small consumers.

ZINC IN THE FEDERAL REPUBLIC OF GERMANY 1980

H. Johnen
Zinkbertung
Dusseldorf, Federal Republic of Germany

Estimated zinc consumption for 1980 will be slightly higher than 1979, but will not reach the standard of 1973.

A significant decrease in consumption in the last quarter of 1980, continuing into early 1981, reduced both production and consumption. We look for an increase in consumption in 1981, but the poor start in 1981 can only be compensated with difficulty by an improved second half.

PRODUCTION, IMPORTS AND EXPORTS
(Metric Tons)

	1976	1977	1978	1979	(Est.) 1980
1. Refined Zinc Production	304,754	354,777	306,836	355,523	368,000
2. Imports	116,900	118,779	130,864	142,383	143,000
3. Exports	92,177	115,985	75,286	82,856	100,000
4. Balance (1+2−3)	329,477	357,571	362,414	415,050	411,000
5. Secondary zinc	21,395	18,653	18,157	21,858	26,000

MANUFACTURING AND AUTO PRODUCTION
(Metric Tons)

	1976	1977	1978	1979	(Est.) 1980
6. Alloys	90,059	95,899	90,628	93,021	90,000
7. Reported metal castings	50,201	49,919	51,435	51,697	48,000
8. Automobile production	3,900,000	4,100,000	4,250,000	4,300,000	4,000,000

SEMI-FINISHED ZINC FOR BATTERIES AND PRINTING PLATES
(Metric Tons)

	1976	1977	1978	1979	(Est.) 1980
9. Semi-finished zinc	52,923	55,937	57,678	60,838	66,000
10. Imports	19,810	16,715	23,227	24,019	25,000
11. Exports	10,293	12,913	13,526	15,015	16,000
12. Balance (10−11)	9,517	3,802	9,701	9,004	9,000

CONSUMPTION
(Metric Tons)

	1976	1977	1978	1979	(Est.) 1980
13. Stocks January 1, 1980	71,461	82,773	93,334	76,738	70,000
14. December 31, 1980	82,773	93,334	76,783	69,679	66,000
15. Change – Increase	11,312	10,561	—	—	—
16. + Decrease	—	—	16,551	7,059	4,000
17. 4+5+12+16−15= Consumption	349,077	369,465	406,823	452,971	450,000

CONSUMPTION OF ZINC BY END-USE
(Metric Tons)

	1976	1977	1978	1979	(Est.) 1980
18. Brass	103,300	99,600	105,400	103,500	105,000
19. Galvanizing:					
Sheets	57,600	60,500	62,300	72,400	73,000
Pipes	17,500	15,900	17,000	9,900	10,000
Wire	11,200	10,000	10,100	10,800	12,000
Hot-dip after fab	54,500	54,500	57,000	69,900	72,000
20. Semifinished zinc	52,900	55,900	57,700	60,900	66,000
21. Zinc Oxide	5,600	6,500	6,100	14,300	15,000
22. Alloys	84,200	85,600	77,600	85,000	84,000
23. Other	2,200	1,800	2,300	3,000	3,000
24. Misc.	1,600	800	1,100	800	1,000
TOTAL	390,600	391,100	396,600	430,500	441,000

ZINC IN FINLAND 1980

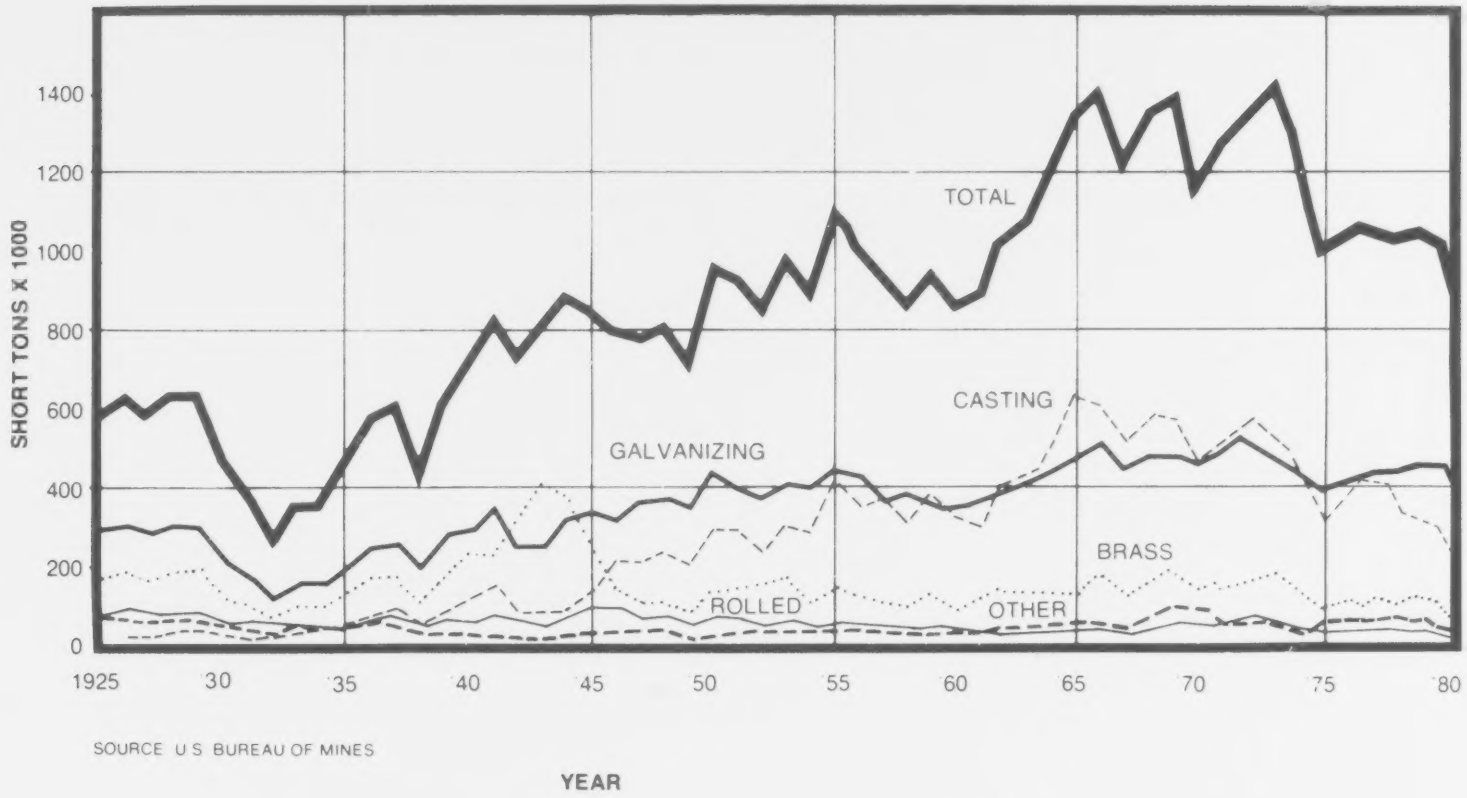
(As Reported by Outokumpu Oy)
Helsinki, Finland

1980 was a record year for zinc consumption in Finland. The total consumption was 24,740 tons, which is 7.5% more than in 1978.

CONSUMPTION OF SLAB ZINC BY END USERS IN FINLAND
(Metric Tons)

	1979	1980
Galvanizing		
General	3,500	4,500
Sheet	12,190	12,700
Wire	830	840
Total	16,520	18,040
Brass	3,000	3,000
Diecasting	900	1,000
Others	2,600	2,700
Total	6,500	6,700
Grand Total	23,020	24,740

CONSUMPTION OF SLAB ZINC IN THE UNITED STATES
(1925—1980)



SOURCE U S BUREAU OF MINES

ZINC IN FRANCE 1980

P. de Puyraimond
Centre Technique du Zinc et de ses Alliages
Levallois, France

The consumption of zinc from all sources, at the first stage of transformation, markedly increased in 1980 to 331,353 tons compared with 286,739 tons in 1979. However, the 1980 figure reflects precautionary buys made by the French government.

French consumption is slightly higher than the European increase of 0.6%, which must be compared with the 5.2% drop in worldwide consumption noted in 1980.

Numerous price variations have been noted in the course of the fiscal year 1980. The $790 per ton price which had been fixed in August 1979 was maintained until January 1980. An increase in February had brought the price up to $825, and then a decrease in October brought it down to $780. In October, the price rose back up to $825.

The production figure predicted for 1981 is 255,000 tons, with an estimated consumption of slightly less than 300,000 tons.

Production of raw slab zinc in 1980 rose to 252,776 tons, an increase of 4,160 tons (1.67%) over the 1979 figure and 21,579 tons (9.33%) more than was produced in 1978.

FRENCH RAW SLAB ZINC PRODUCTION
(Metric Tons)

	1978	1979	1980
Pure and extra pure zinc	168,484	182,398	188,865
Ordinary zinc	62,713	66,218	63,911
	231,197	248,616	252,776

8,395 tons of zinc dust were produced in 1980 as opposed to 8,794 tons in 1979 and 8,206 tons in 1978.

French consumption of raw slab zinc breaks down in the following manner for the period 1978–1980.

FRENCH RAW SLAB ZINC CONSUMPTION
(Metric Tons)

	1978	1979	1980
Production	231,197	248,616	252,776
+ Imports	80,542	79,386	105,068
	311,739	328,002	357,844
− Exports	43,355	39,715	26,491
Apparent French consumption	268,384	288,287	331,353
Incidence of the increase in producers' stocks	+ 13,333	—	—
Incidence of the decrease in producers' stocks	—	− 1,548	− 1,381
	281,717	286,739	329,972

It is to be noted, however, that the General Management of the Customs Department registered certain tonnages of raw zinc containing a very small amount of aluminum under "Zinc Alloys." These tonnages, therefore, are not included in the preceding figures, but in fact they increase French consumption figures by –1,057 tons in 1978, –1,700 tons in 1979, and –2,001 tons in 1980.

DISTRIBUTION TO USERS (FRENCH PRODUCTION)
(Metric Tons)

	1978		1979		1980	
	tons	%	tons	%	tons	%
Galvanizing	93,864[1]	33	97,961[2]	34	94,133[3]	28
Rolled zinc	96,995	35	108,189	38	108,588	33
Alloys[4]	35,718	13	33,736	12	35,099	11
Brass[4]	29,500	11	25,030	9	31,814	10
Zinc Oxide[5]	11,712	4	7,340	2	14,159	4
Wire for spraying	5,168	1	5,601	2	5,699	2
Miscellaneous	8,760	3	8,882	3	40,480	12
	281,717	100%	286,739	100%	329,972	100%

(1) This figure is to be increased to 1,057 tons for the aforementioned reasons.
(2) The increase in 1979 amounts to 1,700 tons.
(3) The increase in 1980 amounts to 2,001 tons.
(4) Zinc content
(5) It is to be noted that raw zinc is only one of the raw materials used for zinc oxide production which totaled to 51,141 tons in 1980 as opposed to 45,416 tons in 1979 and 46,975 tons in 1978.

Rolled Zinc

French consumption of rolled zinc rose by 2,856 tons (3.82%) in 1980 as compared with the 1979 figure, and by 5,558 tons (7.72%) compared with the 1978 figure.

FRENCH CONSUMPTION OF ROLLED ZINC
(Metric Tons)

	1978	1979	1980
Production	96,763	106,017	106,245
+ Imports	11,579	13,590	13,336
	108,342	119,607	119,581
– Exports	40,434	39,797	41,321
	67,908	79,810	78,260
Incidence of the increase in producers' stocks	+ 4,063	—	—
Incidence of the decrease in producer's stocks	—	– 5,137	– 731
	71,971	74,673	77,529

The construction industry remains the most important market for rolled zinc. An analysis of French consumption in the construction sector compared with total consumption (construction plus industry) is indicated in the following percentages:

1978	1979	1980
86.98%	85.94%	86.60%

Galvanizing

French galvanizing industry consumed 103,500 tons of zinc as opposed to 98,900 tons in 1979. These figures include only hot-dip galvanizing.

FRENCH CONSUMPTION OF ZINC IN GALVANIZING
(Metric Tons)

	1979	1980
Sheet	45,200	48,900
Tubes	5,000	3,700
Wire	14,200	16,900
General galvanizing	33,600	34,000

Galvanized Strip

In spite of the weak position of the international steel industry in recent times, the French galvanized strip industry continued to develop in 1980. The following figures will provide a general view of this activity over the past six years. (The table includes galvanized strip, pre-coated galvanized sheets, etc.).

FRENCH GALVANIZED STRIP PRODUCTION
(Thousands of Metric Tons)

	1975	1976	1977	1978	1979	1980	1980/75
French production	808	702	734	851	966	999	+ 24%
French consumption	604	570	615	624	711	809	+ 34%
including imports	100	156	177	183	202	228	+128%

After having been stagnant for a period, French consumption has increased by 14% per year starting from 1978/1979. Supplies from French sources have increased slightly more than imports.

FRENCH GALVANIZED AND PRECOATED PRODUCTS
(Thousands of Metric Tons)

	Galvanized		Precoated	
	1979	1980	1979	1980
Ironmongers	155	190	8	15
Profiles	71	63	9	9
Construction	104	102	38	45
Metal work	23	24	6	7
Mechanics	11	11	6	7
Agricultural machinery	4	4	—	—
Appliances	7	9	1	1
Automobiles	19	17	1	3
Miscellaneous	29	27	2	5
	423	447	71	92

Galvanized tubes

Deliveries to ironmongers have markedly increased from 1979 to 1980, up 23% for galvanized strip and 188% for precoated strip. The construction sector has remained stable except where precoated strip is concerned, as ribbed sections continue to be in great demand. There have

been only few changes in other sectors. Galvanized strip deliveries to the automobile industry have slightly decreased, but this drop is compensated by precoated strip.

Galvanized tube deliveries totaled 42,500 tons in 1980 as opposed to the 1979 figure of 47,000 tons, for a decrease of 9.6%. The 1979 figure, however, represented a 13% increase from 1978 deliveries.

The proportion of galvanized tubes in the total amount of similar tubes was 38.5% as opposed to 37.6% in 1979. In exports, this proportion was 47.1%, as opposed to 50.8% in 1979.

Galvanized wire

Wire product deliveries totaled 1,058,000 tons. The proportion of galvanized wire in the total production was approximately 25%, breaking down as follows:

FRENCH DELIVERIES OF GALVANIZED WIRE
(Metric Tons)

	1980
Galvanized wire	125,000
Galvanized fencing	108,000
Fringes and all other galvanized products	32,000
Total of galvanized products	265,000

General galvanizing (jobbing)

The tonnage of general galvanizing is basically the same as it was in 1979 (34,000 tons in 1980 as opposed to 34,700 tons in 1979).

New efforts were undertaken in 1980 to increase general galvanizing tonnages. A market study was done, and this will lead to wider distribution.

Furthermore, French producers launched an advertising campaign in economic publications to remind interested parties of the advantages of galvanization as a means of protection. This campaign will continue until October 1981 and it should present benefits to the galvanizing industry.

Alloys

POLYGALVA alloy is now optimized, and initial contacts have been made to sell the license and the process to the zinc producers of the free world.

Zinc alloy consumption on the French market dropped slightly in 1980, as it totaled 50,060 tons as opposed to 52,200 tons in 1979.

Zamak alloys represent by far the largest part of this market, as they totaled 49,200 tons, leaving only 860 tons of other zinc alloys, essentially Kayem and ILZRO 12, both gravity cast. Of the above figures, French producers supplied 32,700 tons, while the remaining 16,500 tons were imported.

The slight decrease noted during 1980 is mainly due to the sluggish automobile industry. However, an increase in tonnage consumption can possibly be hoped for in 1981. In fact, the C.T.Z. is carrying out general

interest actions which, in the short or long term, should permit other uses of alloys in areas related to computers, construction hardware, new automobile developments, high fidelity equipment, weighing instruments, etc.

Brass

The consumption of cast brass rose to approximately 4,800 tons as opposed to 4,500 tons in the preceding year.

Production of zinc wire for spraying totaled 5,932 tons in 1980 as opposed to 5,680 tons in 1979 and 5,274 tons in 1978.

Production of zinc dust totaled 8,395 tons in 1980 as opposed to 8,794 tons in 1979 and 8,206 tons in 1978.

FRENCH CAST BRASS PRODUCTION
(Metric Tons)

	1978	1979
Sand and mould cast	8,859.4	9,052.2
Pressure die cast	1,920.3	2,242.2

As concerns wrought brass, the following table shows the French productions in 1979 and their variation compared to those in 1978:

FRENCH WROUGHT BRASS PRODUCTION
(Metric Tons)

Rolled brass	40,930	+ 4%
Wire	8,960	+38%
Bars	114,840	+11%
Tubes	5,760	−10%

Zinc Wire

Production of zinc wire for spraying amounted to 5,680 tons in 1979 against 5,274 tons in 1978 and 4,521 tons in 1977.

Zinc Dust

Production of zinc dust amounted to 8,794 tons in 1979 against 8,206 tons in 1978 and 10,076 tons in 1977.

ZINC IN INDIA 1980

V. K. Sudhakaran, Secretary
Indian Lead Zinc Information Centre
New Delhi, India

Owing to severe power cuts at both smelters of Hindustan Zinc Ltd. and the prolonged industrial dispute and resultant shut down at Cominco Binani Zinc Ltd., the domestic zinc production in India during 1980 was only 43,600 metric tons, compared to 63,315 metric tons in 1979.

Preliminary estimates indicate that zinc imports during 1980 were on the order of 65,000 metric tons.

Shortage of steel and cement caused a lull in the construction activity which in turn dampened the demand for galvanizing, particularly in the structural and tube galvanizing sectors. Nonavailability of matching steel sections hampered production of galvanized transmission line towers.

Exports of steel pipes and tubes (galvanized and black) was only around 50,000 metric tons during the year as opposed to almost double that quantity during 1979. Here again, the steel shortage was the main cause.

Preliminary figures indicate that zinc consumption in 1980 was around 115,000 metric tons. The slight fall of about 5,000 metric tons in consumption, as compared to 1979, is attributed to the infrastructural imbalances which plagued the economy.

Lead and zinc deposits of over 21 million metric tons have been discovered in the Bhilwara District of Rajasthan. Hindustan Zinc Ltd. is going ahead with the mine development program and plans are being drawn up to build a smelter of 140,000 tpy capacity—100,000 tpy zinc and 40,000 lead. The smelter is expected to be completed by 1985. Even after this additional capacity has gone on stream, India will continue to be a net importer of zinc.

Following the fall in zinc produciton, cadmium output declined to 88 metric tons as against 166 metric tons in 1979.

ZINC IN JAPAN 1980

Hiroshi Tanaka, Director General
Japan Lead Zinc Development Association
Tokyo, Japan

Production of zinc in 1980 showed a decrease and amounted to 739,000 metric tons, a decrease of 50,000 metric tons compared with the previous year.

Due to the decline of demand since the oil shock and shortage of zinc concentrates, all zinc smelters in Japan have been in the condition of curtailment of production by 30 to 35% of full capacities.

PRODUCTION OF SLAB ZINC
(In 1,000 Metric Tons)

1976	1977	1978	1979	1980
742	778	768	789	739

Consumption of zinc in 1980 decreased by 22,000 metric tons compared with 1979. This is the main reason why the export of galvanized sheet decreased due to high exchange rate of yen to dollar.

REPORTED CONSUMPTION OF SLAB ZINC
(In 1,000 Metric Tons)

Uses	1976	1977	1978	1979	1980
Sheet galvanizing	273	265	298	319	302
General galvanizing	109	106	115	123	122
Brass, bronze, etc.	100	92	99	99	101
Die casting	117	112	106	119	118
Others	97	92	98	94	88
Total	696	667	716	754	731

ZINC IN MEXICO 1980

A. Guevara R.
Centro Mexicano de Informacion de Zinc y Plomo A.C.
Sonora, Mexico

PRIMARY PRODUCTION OF SLAB ZINC
(Metric Tons)

1980	145,363
1979	159,602
1978	172,233

CONSUMPTION BY END-USE
(Metric Tons)

	1978	1979	1980
Galvanizing	26,740	31,617	39,321
Die Casting Alloys	11,541	16,279	16,193
Zinc Oxide	17,939	12,837	10,322
Small Batteries	6,801	7,746	7,566
Brass*	—	—	10,160
Other	16,145	14,831	5,346
Total	79,166	83,310	88,908

*Reporting for brass began in 1980

EXPORTS
(Metric Tons)

1980	58,523
1979	76,140
1978	98,828

ZINC IN SCANDINAVIA 1980

Magnus Blomkvist
Scandinavian Lead Zinc Association
Stockholm, Sweden

SCANDINAVIAN ZINC PRODUCTION AND CONSUMPTION
(In 1,000 Metric Tons)

	1978	1979	1980 Preliminary
Mine production	274.8	290.4	276.7
of which:			
Denmark (Greenland)	82.4	87.3	81.3
Norway	29.6	28.6	28.0
Sweden	162.8	174.5	167.4
Smelter production	71.3	77.5	79.1
of which:			
Denmark	—	—	—
Norway	71.3	77.5	79.1
Sweden	—	—	—
Consumption of slab zinc by end uses:			
Sheet galvanizing	10.8	11.6	9.6
General galvanizing	35.6	33.5	33.0
Brass	10.5	10.5	10.0
Die casting	7.2	8.2	8.0
Others	8.1	10.2	10.4
Total	72.2	74.0	71.0
of which:			
In Denmark	15.4	17.1	17.0
In Norway	17.4	15.3	16.0
In Sweden	39.4	41.6	38.0

ZINC IN SPAIN 1980

V.R. Pena, Director
Asociacion Tecnica Española Para el Desarrollo del Zinc
Madrid, Spain

The production of zinc in Spain during 1980 rose to 151,733 metric tons, thus showing a decrease of 34,309 tonnes compared with the previous year. The tonnages of slab zinc, percentages, and variations during 1979 and 1980 are shown in the following table:

PRODUCTION OF SLAB ZINC
(In Metric Tons)

Grade	1979	%	1980	%	Variation 1980/1979
Pure and Extra Pure Zinc	180,567	97.06	143,631	94.60	−20.5
Ordinary Zinc	5,475	2.94	8,102	5.40	+47.9
Total	186,042	100.00	151,733	100.00	−18.4

The following table gives a breakdown of the domestic consumption of raw slab zinc for the main end uses 1979-1980.

CONSUMPTION OF SLAB ZINC
(In Metric Tons)

End Uses	1979	1980
Galvanizing		
General	13,474	13,824
Tube	8,575	8,335
Wire	4,611	5,190
Sheet and strip	15,457	11,366
Total	42,117	38,715
Brass	15,549	17,162
Rolled Zinc	8,012	4,733
Die Casting	22,836	21,183
Zinc Oxide	2,865	3,317
Zinc Dust	3,631	2,978
Cathodic Protection	815	710
Anodes for Electroplating	1,073	841
Miscellaneous	941	1,444
Total	55,722	52,368
GRAND TOTAL	97,839	91,083

In 1980 the consumption of primary zinc ingots rose to 91,083 metric tons, which is 6,756 metric tons less than the previous year (97,839 tonnes); that is to say, there was a variation of −6.9%.

The total consumption of zinc alloys during 1980 reached 22,164 tonnes; of this total, 11,910 tonnes were alloys with copper, and 10,254

tonnes were alloys without copper, which respresent 53.7% and 46.3% respectively of the total zinc alloys. The total variation, compared with the previous year is −7.7%.

Rolled zinc during 1980 decreased by 3,279 tons compared to 1979. This variation represents a −40.9% compared with the previous year. The breakdown of rolled zinc consumption is as follows: Rolled for building, 2,961 tonnes (62.6%); for dry cells, 1,548 tonnes (32.7%); and for miscellaneous, 224 tonnes (4.7%).

The estimates of the production and consumption for 1981 are not very optimistic and plants will go on working under their capacity. Consumption will continue at a similar rate to that of 1980.

ZINC IN THE UNITED KINGDOM 1980

R.L. Stubbs and A.S. Riley
Zinc Development Association
London, England

1980 was a depressing year for zinc in the United Kingdom with consumption of zinc in all forms falling by about 22 percent to 243,600 tonnes, 68,100 tonnes less than in 1979. The consumption of slab zinc amounted to 181,300 tonnes, about 57,500 tonnes below the previous year's figures.

The economic depression affected all uses except general galvanizing, which was slightly up on 1979, and rolled zinc, which is used mainly in batteries, also held up well. There was, however, a substantial fall in the consumption of zinc for die castings, not only by the automobile industry, but in particular by the toy makers for whom the export market declined rapidly with the rise in the value of the pound sterling. Compared with 1979, strip galvanizing fell by 46 percent to 18,500 tonnes, having suffered from the prolonged steel strike during the early months of the year. Wire galvanizing fell by 12 percent to 12,900 tonnes due to the decline in construction and heavy engineering. The 18 percent fall in zinc for brass to 66,700 tonnes reflected the low rate of building construction, plumbing and electrical fittings being an important market.

Slab zinc production was 13 percent up at 86,700 tonnes. UK zinc production is based on imported concentrates, but in 1980 imports of ores and concentrates were down to 81,700 tonnes. Peru was the major supplier at 23,900 tonnes. Imports from Australia fell to 17,500 tonnes from 30,500 tonnes in 1979.

Total imports of slab zinc were 130,300 tonnes, about 45,900 tonnes down. Canada, The Netherlands, Finland and Norway were the largest suppliers as they had been in 1979. Exports of slab zinc from the United Kingdom rose by 14,800 tonnes to 27,000 tonnes.

UK CONSUMPTION OF ZINC IN ALL FORMS 1976–1980
(In 000 Metric Tons)

End Uses	1976	1977	1978	1979	1980
Galvanizing					
General	35.9	34.1	35.7	34.4	34.6
Sheet and Strip	25.8	23.8	27.3	34.2	18.5
Wire	15.8	15.8	15.8	14.7	12.9
Tube	6.4	7.2	6.4	5.9	3.1
Galvanizing Total	83.9	80.9	85.2	89.2	69.1
Brass	83.8	87.5	86.7	81.6	66.7
Rolled Zinc	20.6	23.4	23.2	20.6	19.1
Zinc Oxide	33.7	32.4	29.8	29.9	26.6
Zinc Die Castings	61.9	62.7	65.9	62.1	37.7
Zinc Dust	11.4	12.6	13.5	12.9	10.5
Miscellaneous Uses	15.3	15.6	15.6	15.4	13.9
Total	310.6	315.1	319.9	311.7	243.6
of which slab zinc	242.8	244.8	247.6	238.8	181.3

UNITED KINGDOM SLAB ZINC SUPPLIES 1976–1980
(In 1,000 Metric Tons)

	1976	1977	1978	1979	1980
Production					
Slab Zinc—Total	41.6	81.5	73.6	76.7	86.7
(of which high purity)	6.6	27.3	23.4	25.3	26.1
Imports					
Ores and Concentrates	57.8	79.5	75.2	98.4	81.7
of which from					
Australia	—	0.9	13.4	30.5	17.5
Irish Republic	4.5	18.2	14.8	17.8	20.9
U.S.A.	0.9	3.3	2.9	12.3	1.3
Peru	23.0	19.2	15.9	19.3	23.9
Slab Zinc—Total	193.9	197.9	181.5	176.2	130.3
of which from					
Australia	5.5	4.8	1.2	1.5	0.9
Belgium	6.9	7.2	0.8	8.5	2.9
Canada	40.9	47.8	47.2	45.7	47.3
Finland	29.1	25.3	37.0	36.6	24.0
Germany FR	6.0	13.8	11.3	7.8	4.4
Netherlands	75.7	50.5	45.2	43.8	34.3
Norway	8.4	15.1	14.8	15.1	6.9
Exports & Re-exports					
of slab zinc	7.3	17.1	15.0	12.2	27.0

Review of Cadmium in the United States in 1980

TABLE I. SALIENT STATISTICS OF CADMIUM
(In Tons of 2,000 lbs.)

	1979	1980
Stocks of metal beginning of period:		
Metal producers	1270	558
Compound producers	50	57
Distributors	326	376
Production (Primary and Secondary)[1]		
Metal	2009	1739
Sulphide[2]	1648	883
Other compounds[3]	1737	911
Shipments[4]		
Metal (includes secondary)	2613	1401
Compounds	1978	1818
Apparent Consumption	5429	3899
Imports (metal)	2835	2884
Exports (metal)	233	260
Stocks of metal end of period		
Metal Producers	558	927
Compound Producers	57	44
Distributors	376	487
Average U.S. producer price	$2.76/lb.	$2.84/lb.

1. Includes equivalent metal content of cadmium sponge used directly in production of compounds.
2. Includes cadmium lithopone and cadmium sulfoselenide.
3. Includes plating salts and oxide.
4. Shipments include internal plate consumption.

Source: U.S. Bureau of Mines.

The U.S. Bureau of Mines estimates 1980 consumption of cadmium in the United States at 3,899 tons, 28% lower than 5,429 tons in 1979 (Table 2). U.S. refinery production of cadmium metal, both primary and secondary, declined 14% from 2,009 tons in 1979 to 1,729 tons in 1980. Production of cadmium sulphide decreased nearly 50% from 1,648 tons in 1979 to 883 tons in 1980. Other cadmium compounds such as plating salts and oxide, showed a reduced production in 1980 of 911 tons, 48% down from 1,737 in 1979. The closing of New Jersey Zinc's smelter in Palmerton, Pennsylvania, as well as environmental factors, contributed to lower production.

Stocks at metal producers rose steadily through the year from 558 tons to 927 tons. Stock at both compound producers and at distributors fell, however.

Imports and exports remained relatively steady in 1980. The U.S. imported 2,884 tons of cadmium metal in 1980 with major sources being Canada, Australia, Mexico, Korea, Peru, Finland and the Netherlands (Table 3). The U.S. exported 260 tons of cadmium metal in 1980 (Table 4).

TABLE 2. CADMIUM CONSUMPTION (ESTIMATED)*
(In Tons of 2,000 lbs.)

	1976	1977	1978	1979	1980
Transportation[1]	1003	761	849	926	663
Coating & Plating	1995	1521	1687	1841	1326
Batteries	1300	981	1091	1190	858
Pigments	739	573	650	705	507
Plastics & Synthetic Products	661	507	551	595	429
Other[2]	233	137	143	172	116
	5931	4480	4971	5429	3899

1. Includes coating and plating of aircraft and vehicles
2. Includes cathode-ray phosphors, catalysts, nuclear reactor control, fire detection devices, solar photovoltaics, alloys and solders

*Estimated by the U.S. Bureau of Mines.

The Federal Emergency Administration revised the cadmium strategic stockpile goal downward in May, 1980, from 12,350 tons to 5,850 tons with 3,165 tons on hand.

In January the producer price for cadmium rose from $2.50 to $3.25 per pound; this price prevailed through April when the price dropped to $3.00 per pound. By October the price lowered to $2.50 per pound where it remained until year end.

Cadmium markets in 1980 felt the effects of a general economic recession as well as restrictive environmental controls. Cadmium's largest market, plating, suffered from cutbacks in the steel and construction industries in 1980 going from 1,841 tons in 1979 to 1,326 tons.

Cadmium is used to plate steel and other metals to give superior corrosion protection. Its use in the automotive, construction and electronic industries, as well as in military applications, is expected to improve with a recovering economy and with development of more efficient pollution controls and health monitoring devices.

Cadmium consumed in transportation related uses, such as mass transit, passenger vehicles and aerospace, went from 926 tons in 1979 to 663 tons in 1980.

Batteries consumed 858 tons of cadmium in 1980. The market for nickel-cadmium rechargeable batteries has been a stable one and should continue to grow. Because of their reliability, low maintenance and long life, nickel-cadmium batteries have gained wide acceptance. Use of cadmium in large batteries for electric vehicles as a possible substitute for cobalt could add substantially to this market in the future.

Pigments, which consumed 507 tons in 1980 compared to 705 tons in 1979, is considered another growth market for cadmium. Plastics consume cadmium pigments as coloring agents. Obviously, growth of cadmium in this market is related to growth in plastics production, specifically polyvinylchloride (pvc).

Demand for cadmium in other markets, such as alloys and catalysts, was 116 tons in 1980. Use of cadmium in energy-related industries as solar photovoltaics, nuclear power generation, and electrification of railways, should grow within the coming years.

TABLE 3. U.S. IMPORTS OF CADMIUM METAL
(In Tons of 2,000 lbs.)

	1976	1977	1978	1979	1980
Algeria	—	—	22	—	—
Australia	421	448	448	352	632
Austria	—	—	6	—	—
Belgium-Luxembourg	279	246	322	262	46
Canada	1052	471	735	766	909
China, Peoples Republic	—	—	—	—	18
Cocos Islands	—	—	—	—	9
Denmark	—	—	—	6	—
Finland	43	131	91	142	131
France	130	13	62	110	41
Germany, Fed. Rep.	133	44	101	23	11
India	40	6	9	—	55
Italy	32	—	7	—	—
Japan	—	—	5	11	10
Korea, Rep. of	110	105	266	220	193
Mexico	394	436	481	317	374
Netherlands	52	122	88	114	124
Norway	—	—	6	118	34
Peru	95	90	143	156	157
Portugal	—	—	—	8	—
Spain	39	63	179	65	55
Sweden	—	22	53	25	5
United Kingdom	11	6	18	25	5
U.S.S.R.	193	—	—	—	—
Yugoslavia	322	351	110	90	77
Zaire	66	17	39	28	—
Total	3,412	2,571	3,191	2,838	2,886

Source: U.S. Bureau of the Census

TABLE 4. EXPORTS OF CADMIUM METAL
(In Tons of 2,000 lbs.)

1980	260
1979	233
1978	360
1977	118
1976	252

Source: U.S. Bureau of the Census

CADMIUM IN CANADA 1980

M.J. Gauvin
Energy, Mines and Resources Canada
Ottawa, Ontario

Cadmium metal is recovered as a byproduct of zinc smelting and refining. The cadmium metal producers in Canada are: Canadian Electrolytic Zinc Limited, Valleyfield, Quebec; Cominco Limited, Trail, British Columbia; Hudson Bay Mining and Smelting Co. Ltd., and Texasgulf Canada Ltd., Ontario. These plants have an annual capacity of 1,705 tonnes.

CANADIAN PRIMARY CADMIUM STATISTICS, 1977–80

	1977	1978	1979	1980p
	(metric tonnes)			
Metal Production	1,369	1,265	1,466	1,303
Metal Capacity	1,705	1,705	1,705	1,705
Metal Shipments:				
Domestic	85	142	121	88
Exports				
United States	408	724	721	827
United Kingdom	404	379	561	344
Others	57	156	10	24

p—Preliminary

CADMIUM IN SPAIN 1980

V. Pena, Director
Asociación Tecnica Española para el Desarrollo del Zinc
Madrid

SALIENT STATISTICS
(Metric Tons)

	1979	1980
Production	222	309
Consumption	120	97
Export	72	246

CADMIUM IN THE UNITED KINGDOM 1980

R.L. Stubbs and A.S. Riley
Cadmium Association
London, England

Despite growing concern about cadmium in the environment and moves by Sweden and other countries to restrict certain uses, consumption in 1980 held up well. The decline of 164 tonnes to 1,281 tonnes can largely be attributed to the economic recession. Table 1 shows that breakdwon of consumption by main end uses for the past five years.

Consumption for most uses was well maintained and that for plating even increased slightly over the previous year. Use of cadmium for batteries is covered by 'miscellaneous' but is known to have been about the same as in 1979. The decline in consumption was largely restricted to colours which include both pigments and stabilizers used in the manufacture of plastics. The plastics industry is known to have been particularly badly hit by the recession.

Table 2 shows the make-up of United Kingdom cadmium supplies over the period 1976–1980. In 1980 about one third of UK supplies of cadmium were accounted for by domestic production, compared with less than a quarter in 1979. Production in the United Kingdom in fact fell to 375 tonnes from 424 tonnes in 1979 and imports declined to 793 tonnes from 1432 tonnes in 1979. Canada is the United Kingdom's major supplier accounting for about half of total imports.

Future cadmium consumption may be restricted by environmental measures to control or limit cadmium in various uses. As far as the United Kingdom is concerned, the Department of the Environment published in 1980 a comprehensive survey on cadmium and its uses entitled "Cadmium in the Environment and its Significance to Man". This indicated that there were no immediate plans for introducing controls, although it was thought necessary to keep man's total intake of cadmium as low as practicable. Of particular interest was another Government report published about high cadmium concentrations in the soil in the village of Shipham, where old mining residues had caused cadmium-in-soil levels to be raised by up to 1,000 times the normal background levels. However, despite high levels of cadmium in home-grown food and above average cadmium intake by the local residents, no general adverse health effects have been detected.

TABLE 1. UK CONSUMPTION OF CADMIUM 1976–1980
(In Metric Tons)

	1976	1977	1978	1979	1980
End Uses					
Plating Anodes	281.4	237.7	286.5	293.7	315.3
Plating Salts	182.3	127.8	147.8	178.9	166.5
Cadmium Copper	28.5	33.5	36.7	34.6	28.6
Other Alloys	14.3	11.7	10.6	10.9	10.8
Solder	30.4	27.1	24.7	24.5	24.5
Colours	640.0	577.9	687.7	768.4	603.3
Miscellaneous and batteries	236.7	189.9	160.2	133.8	131.9
Total	1,413.6	1,205.6	1,354.2	1,444.8	1,280.9

TABLE 2. UK SUPPLIES OF CADMIUM 1976–1980
(In Metric Tons)

	1976	1977	1978	1979	1980
Production	189.7	295.4	290.5	424.4	375.1
Imports—Total	1,299.4	1,297.3	1,173.9	1,431.6	793.2
Cadmium metal of which from					
Australia	121.9	84.1	92.3	94.4	51.0
Belgium	10.5	46.8	51.4	22.2	18.5
Canada	424.3	490.1	430.2	699.3	377.2
Finland	99.4	74.3	126.5	155.9	188.9
Germany FR	22.2	29.4	25.8	27.9	21.8
Japan	105.3	112.3	203.8	134.0	124.6
Namibia	70.9	41.6	43.3	—	34.7
Netherlands	338.8	229.1	110.1	188.3	29.3
U.S.A.	5.4	3.3	1.2	22.8	5.3
Other Countries	15.0	0.2	—	28.5	11.9
Exports—Total	103.1	105.9	155.1	73.1	133.5

SUPPORTING COMPANIES—ZINC INSTITUTE INC.

Full Members

Amax Lead & Zinc, Inc.
ASARCO Incorporated
Australian Mining & Smelting Co. Ltd.
Ball Corporation,
Metal & Chemical Division
Billiton International Metals, B.V.
The Broken Hill Associated Smelters Pty.
The Bunker Hill Company
Certified Alloys Company
Eastern Alloys, Inc.
Electrolytic Zinc Company of
Australasia, Ltd.
Homestake Mining Company
Hudson Bay Mining & Smelting Co. Ltd.
Industrial Minera Mexico, S.A.
Metallgesellschaft A-G
National Zinc Company
Noranda Sales Corp., Ltd.
Outokumpu Oy
Ozark Lead Company
The Pigment & Chemical Co., Ltd.
Pinole Point Steel Company
The Platt Brothers & Company
The Sherwin Williams Company
Texasgulf Inc.

Contributing Members

Exxon Minerals Company, U.S.A.
Penoles Metals & Chemicals, Inc.
St. Joe Resources Company

Associate Members

Associate Metals & Minerals Corp.
T.L. Diamond & Company, Inc.
Gerald Metals, Inc.
Intramet International Corp.
M.M.C. Corporation
Mitsui Mining & Smelting Co. Ltd.
Preussag Aktiengesellschaft
Sandoval Zinc Company
Societe Generale Des Minerais

Zinc Institute Incorporated, a non-profit organization, is the trade association of the zinc industry of the United States and Canada with substantial support from producers in other countries of the world, as well as fabricators and consumers. The Institute does not produce or sell zinc but promotes market development, collecting and distributing information relative to the uses of this metal wherever required. Sources of information are its own files and experience, close industry contact and research. Its programs are conducted by means of consultation, educational campaigns, publications, motion pictures, industrial advertising, and technical and general publicity.

The services and publications of the Zinc Institute are available without charge to anyone interested in the utilization of zinc, zinc containing, or zinc-coated products.

Its programs are funded primarily through the voluntary acceptance by producers of assessments against their sales in the United States and Canada.

SUPPORTING COMPANIES—CADMIUM COUNCIL, INC.

Members

Amax Lead & Zinc, Inc.
ASARCO Incorporated
Australian Mining & Smelting Co., Ltd.
The Bunker Hill Company
Coulter Systems Corporation
Electrolytic Zinc Company of Australasia, Ltd.
Harshaw Chemical Company
Hudson Bay Mining & Smelting Co., Ltd.
Kraft Chemical Company
National Zinc Company
Noranda Sales Corporation, Ltd.
Texasgulf Metals Company
A Division of Texasgulf Inc.

Cadmium Council, Incorporated, a non-profit organization, is the trade association of the cadmium industry of the United States and Canada with substantial support from producers in other countries of the world. The Council does not produce or sell cadmium but promotes market development, collecting and distributing information relative to the uses of this metal wherever required. Sources of information are its own files and experience, close industry contact and research. Its programs are conducted by means of consultation, educational campaigns, publications, industrial advertising, and technical and general publicity.

The services and publications of the Cadmium Council are available without charge to anyone interested in the utilization of cadmium.

Its programs are funded primarily through the voluntary acceptance by producers of assessments against their sales in the United States and Canada.